

**REMARKS / ARGUMENTS**

Reconsideration of the above-identified patent application in view of the amendments above and the remarks following is respectfully requested.

Claims 1-11 and 14-18 are in this case. Claims 1-11 and 14-18 have been rejected under 35 U.S.C. 102(b). Claims 8-11 have been rejected under 35 U.S.C. 103(a). Independent claims 1 and 14 have been amended.

The claims before the Examiner are directed towards a projectile for piercing armor having a first "cruise" motor and a second "penetration" or acceleration rocket motor activated at an appropriate distance from the target, and for a method of piercing armor using the same.

**35 U.S.C. 102(b) Rejections – Petters DT 24 27 680**

The Examiner has rejected claims 1-11 and 14-18 under 35 U.S.C. 102(b) as being anticipated by DT 24 27 680 A1 (Detters). The Examiner's rejection is respectfully traversed.

Detters teaches (page 3, third paragraph) a supplementary booster to a kinetic energy based armor-penetrating warhead. Once the warhead is in the proximity of an armored target, the supplementary booster is activated to accelerate the warhead to a high velocity, increasing armor-piercing capacity (page 4, line 27). Thus, a supplementary booster allows for energy efficient flight of an armor-destroying weapon to the proximity of the target (page 4, line 30) without comprising armor-piercing capacity.

Detter does not teach of a "cruise motor" which maintains the initial velocity in order to avoid scattering caused by cross winds (*vide infra*) or of a cruise velocity *per se*, a critical and integral part of the present invention as noted in independent claims 1 and 14. Rather, in one embodiment Detter countenances fitting a kinetic energy based armor-piercing warhead of a guided missile with a supplementary booster. Such a guided missile does not have a cruise motor as defined in unamended claim 1 of the instant application which is "...for

maintaining a cruise velocity of the projectile..". Thus not all features of independent claims 1 and 14 are disclosed in Detter.

The incompleteness of Detter's teachings as well as the differences between the instant invention and the teachings of Detter become even clearer when considering the application of a supplementary booster of Detter to barrel-launched kinetic energy based armor-piercing warhead.

A prior art warhead, for example the kinetic penetrator of an improved APDS shell, exits a cannon barrel at high velocities, in the order of up to 2000 m/sec. Due to air resistance, the kinetic penetrator impacts the target at a significantly lower velocity reducing the armor-piercing capacity. As is clear to one skilled in the art, the further the kinetic penetrator travels, the lesser the armor-piercing capacity. Due to the small diameter of the kinetic penetrator, the effect of side-winds is minimal, causing a scatter of in the order of 1 meter for a 4 km flight.

If one were to apply the teachings of Detter to a prior art warhead, the warhead, upon reaching a target, would be accelerated to a high velocity and thus have an increased armor-piercing capacity independent of range. However, the addition of a supplementary booster according to Detter necessarily increases the physical size of the warhead. The magnitude of velocity loss would be increased, necessitating a greater barrel elevation for any given range and the concomitant difficulties in hitting a target. Further, the lower velocity coupled with the larger cross section makes such a shell susceptible to cross winds. It can be estimated that such a shell would have a side-wind dependent scatter in the order of tens of meters for a 4 km flight. It is clear to one skilled in the art that a barrel launched shell according to the teachings of Detter is practically useless.

In contrast, the innovative addition of a first motor for maintaining a substantially constant cruise velocity of the projectile (the driving force approximately equals drag) and an

acceleration rocket motor for accelerating the projectile from the cruise velocity to a penetration velocity as described, *inter alia*, in claim 1 of the instant application overcomes these problems. The cruise motor is activated after the warhead exits the barrel. The cruise motor of the present invention substantially maintains a constant cruise velocity, reducing the effects of side winds and allows for a flat “ballistic” trajectory, despite the larger size of the shell.

It is important to note that it is also important that a cruise motor of the present invention not allow any substantial warhead acceleration. As is clear to one skilled in the art, acceleration of a warhead into a side-wind leads to “into the wind” torque that causes very high levels of scatter. This can be exceptionally problematic in areas where updrafts and downdrafts change the elevation of flight and the consequent range of a warhead.

One might claim that the presence of a guidance system as mentioned by Detter and also included in the present invention overcomes these problems. However it is clear that to correct for the minor deviations in trajectory resulting from the use of the present invention, much cheaper, simpler and smaller guidance systems are required then when using a non-cruise motor of Detter.

While continuing to traverse the Examiner’s rejections, Applicant has, in order to expedite prosecution, chosen to amend independent claims 1 and 14.

Claim 1 has been amended by adding the limitation “...wherein the projectile is adapted to be shot from a barrel”. Support for this amendment can be found, *inter alia*, in Figure 1c.

Claim 14 has been amended by replacing the term “launching said projectile at the target” with the term “bringing said projectile to said cruise velocity by a process including shooting said projectile from a barrel”. Support for this amendment can be found, *inter alia*, on page 8 lines 13 to 21 of the specification.

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Claim 1 and claim 14 have also been amended by deleting the words "...after launch..." as unnecessary and potentially confusing. Since the acceleration motor accelerates the projectile from a cruise velocity, the acceleration necessarily does this "after launch".

Amended independent claims 1 and 14 now feature language that absolutely differentiates between claims 1 and 14 and the teachings of Petter. Applicant believes that the amendment of the claims renders independent claims 1 and 14, and consequently claims 2-11 and 15-18 respectively dependent therefrom, are in condition for allowance.

**35 U.S.C. 103(a) Rejections – Petter ‘766 in light of Jacobsen ‘243**


The Examiner has rejected claims 8-11 under 35 U.S.C. 103(a) as being obvious from Petter in light of US 4,127,243 (Jacobsen). The Examiner's rejection is respectfully traversed.

Claims 8-11 are dependent from claim 1. Petter, even in light of Jacobsen does not teach all features of claim 1, *vide supra*. Consequently, Applicant maintains that claims 8-11 are in condition for allowance.

In light of the above, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

Respectfully Submitted,

  
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July 4, 2002

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the claims:**

**Claim 1 has been amended as follows:**

1. (twice amended) A projectile for piercing armor comprising:

- a) a first motor for maintaining a cruise velocity of the projectile; and
- b) an acceleration rocket motor activated ~~after launch~~ for accelerating the projectile from said cruise velocity to a penetration velocity, in a final stage of flight of the projectile

**wherein the projectile is adapted to be shot from a barrel.**

**Claim 14 has been amended as follows:**

14. (twice amended) A method for piercing armor of a target, the method comprising the steps of:

- a) providing an armor piercing projectile including:
  - i. a first motor for maintaining a cruise velocity of said projectile; and
  - ii. an acceleration rocket motor activated ~~after launch~~ for accelerating said projectile from said cruise velocity to a penetration velocity in a final stage of flight of said projectile;
- b) ~~launching said projectile at the target~~ **bringing said projectile to said cruise velocity by a process including shooting said projectile from a barrel;**
- c) maintaining said projectile at said cruise velocity;
- d) increasing said velocity of said projectile to a penetrating velocity; and
- e) impacting the target with said projectile ~~at~~ said penetrating velocity.